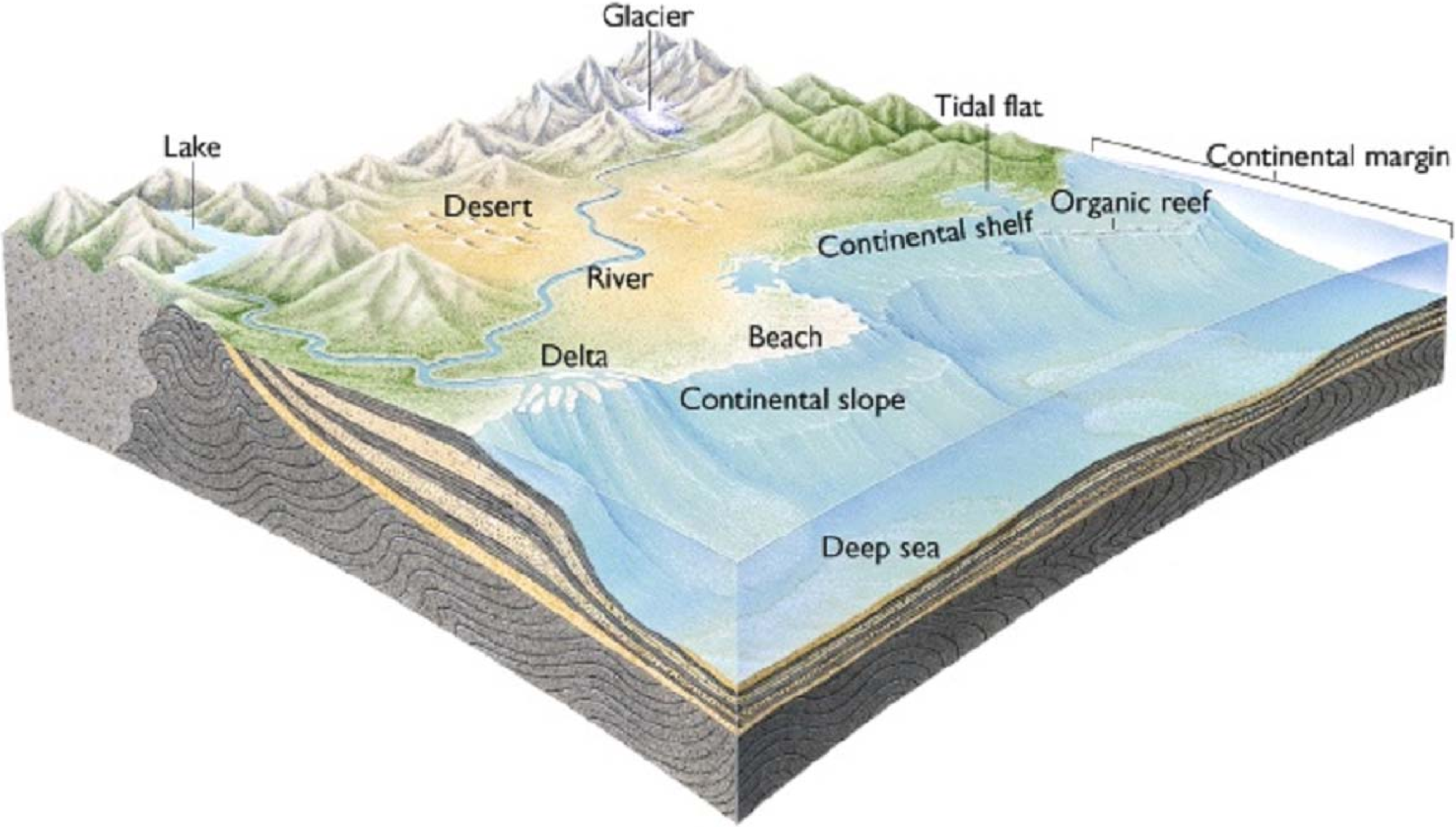
Depositional Environment

Lecture 12#

Sedimentary Environments of Depositional



- Type and geometry of sedimentary rocks
- Key to paleogeography
- Prediction of distribution of source rocks and reservoirs.

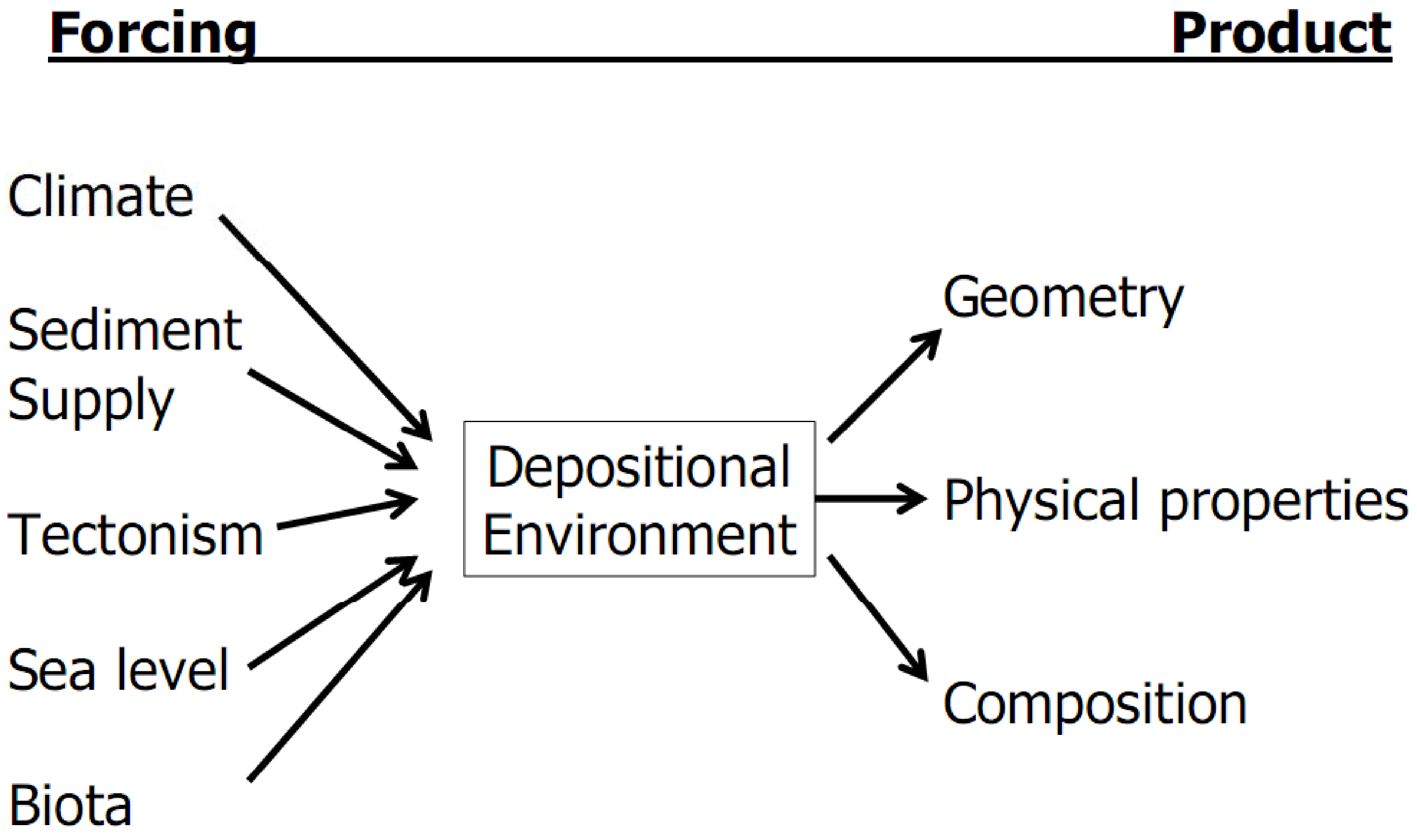
- Geomorphic setting in which a particular set of physical, chemical and biological processes operates to generate a certain kind of sedimentary deposit
- Physical environment has static and dynamic elements
  - Static: basin geometry, sediment composition, water depth, etc.
  - Dynamic: currents (wind, water), precipitation, climate

- N.B. ➔ many/most of “static” variables actually changes over geologic time : ex. basin shape, water depth.

- Chemical elements: pH, Eh, Salinity, pCO_2, etc.
- Biological aspects: activities of organisms (burrowing, skeletal particles, etc.) and their remains (e.g., peat)

- Continental
  - Fluvial
    - Alluvial fan, braided river, meandering river
  - Desert, Lacustrine, Glacial
  - Deltaic
    - Delta plain, delta front, prodelta
- Marginal marine
  - Beach, Barrier Island, Estuary, Tidal Flat
- Marine
  - Continental Shelf
    - Carbonate Reefs and associated environments, silliciclastic shelves
  - Continental slope and ocean floor

- Objective: use sedimentary deposits to interpret depositional environments
- Physical, biological, chemical parameters of an environment combine to produce a body of sediment characterized by specific textural, structural and compositional properties
- Distinctive bodies of sediments or sedimentary rocks



Forcing **Product**

Climate

Sediment Supply

Tectonism

Sea level

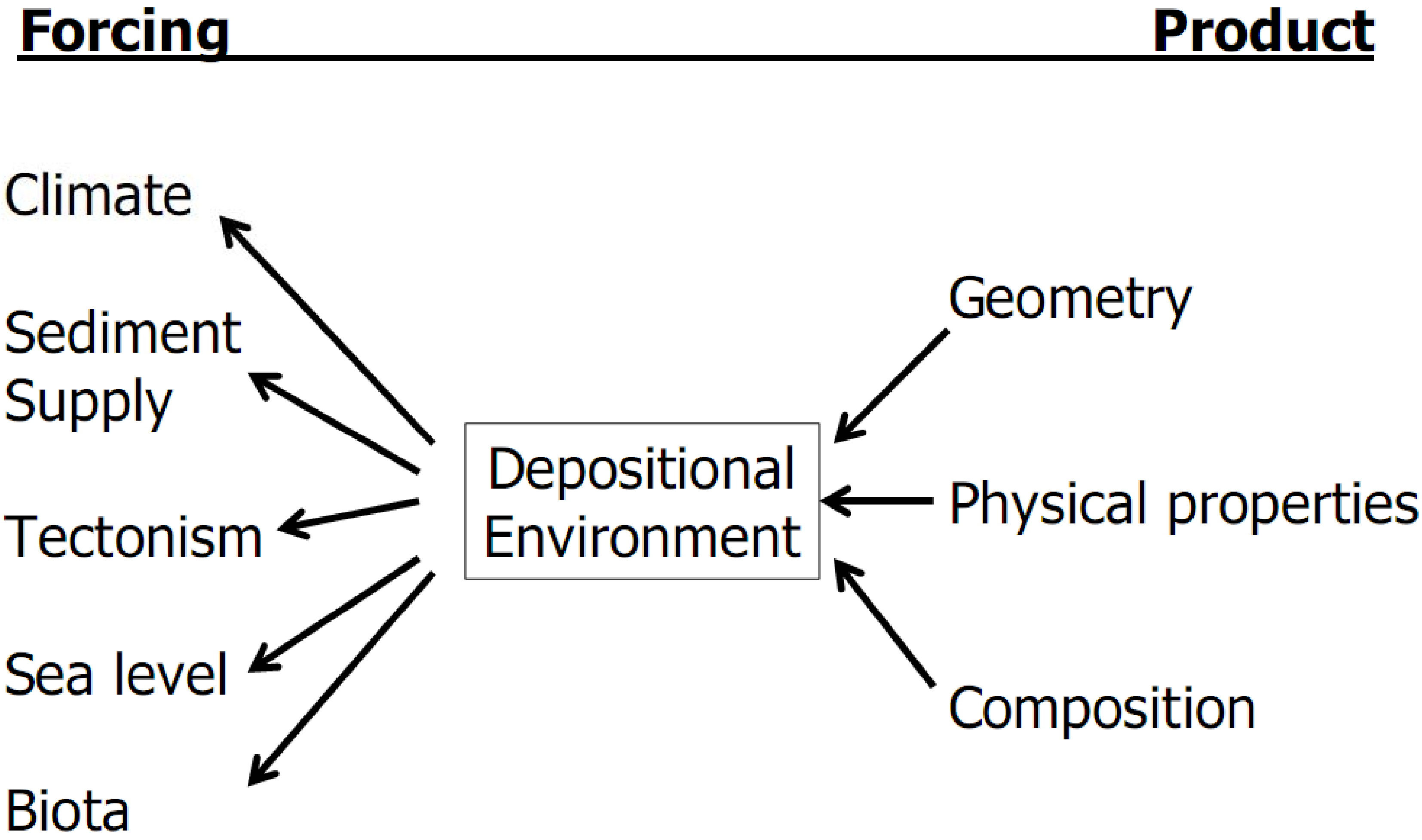
Biota

Depositional Environment

Geometry

Physical properties

Composition



Forcing **Product**

Climate

Sediment Supply

Tectonism

Sea level

Biota

Depositional Environment

Geometry

Physical properties

Composition

Existing Depositional Environment

- Continental
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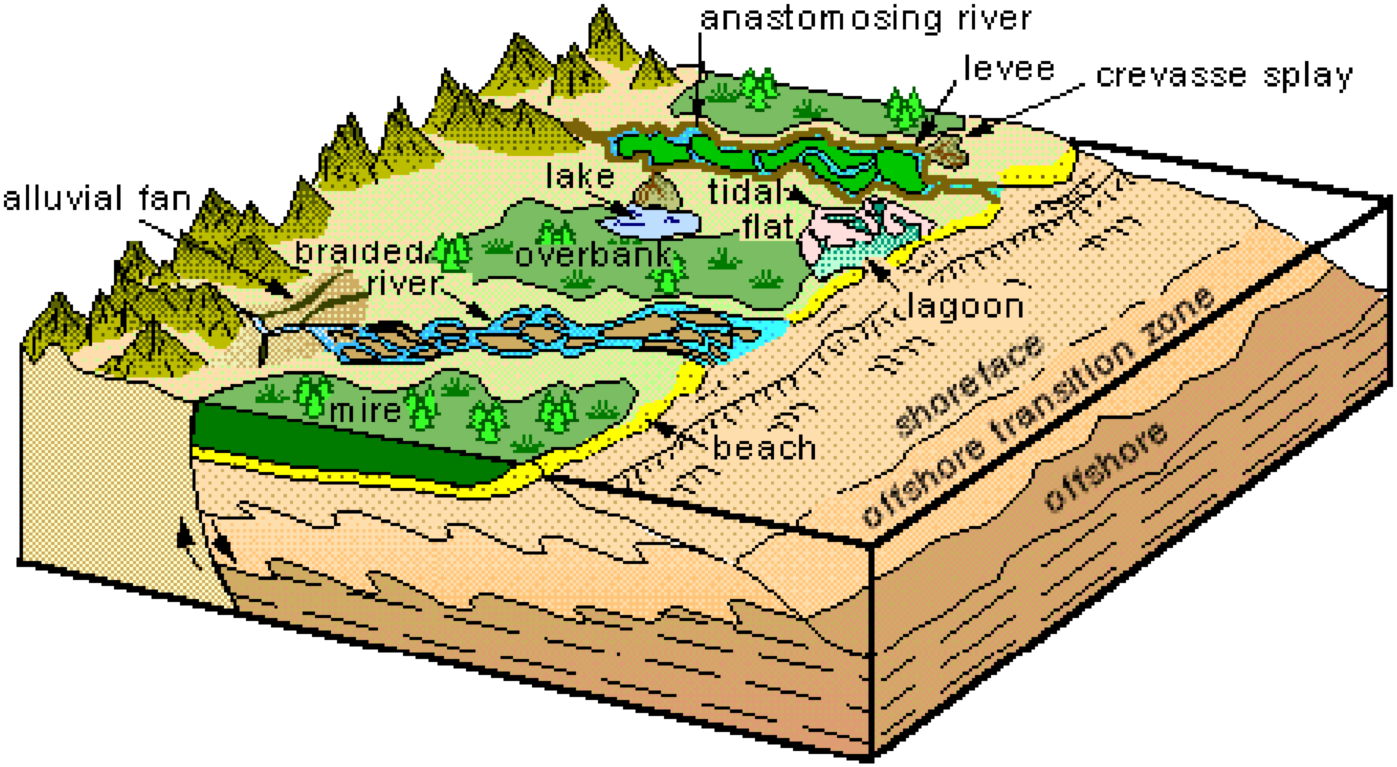
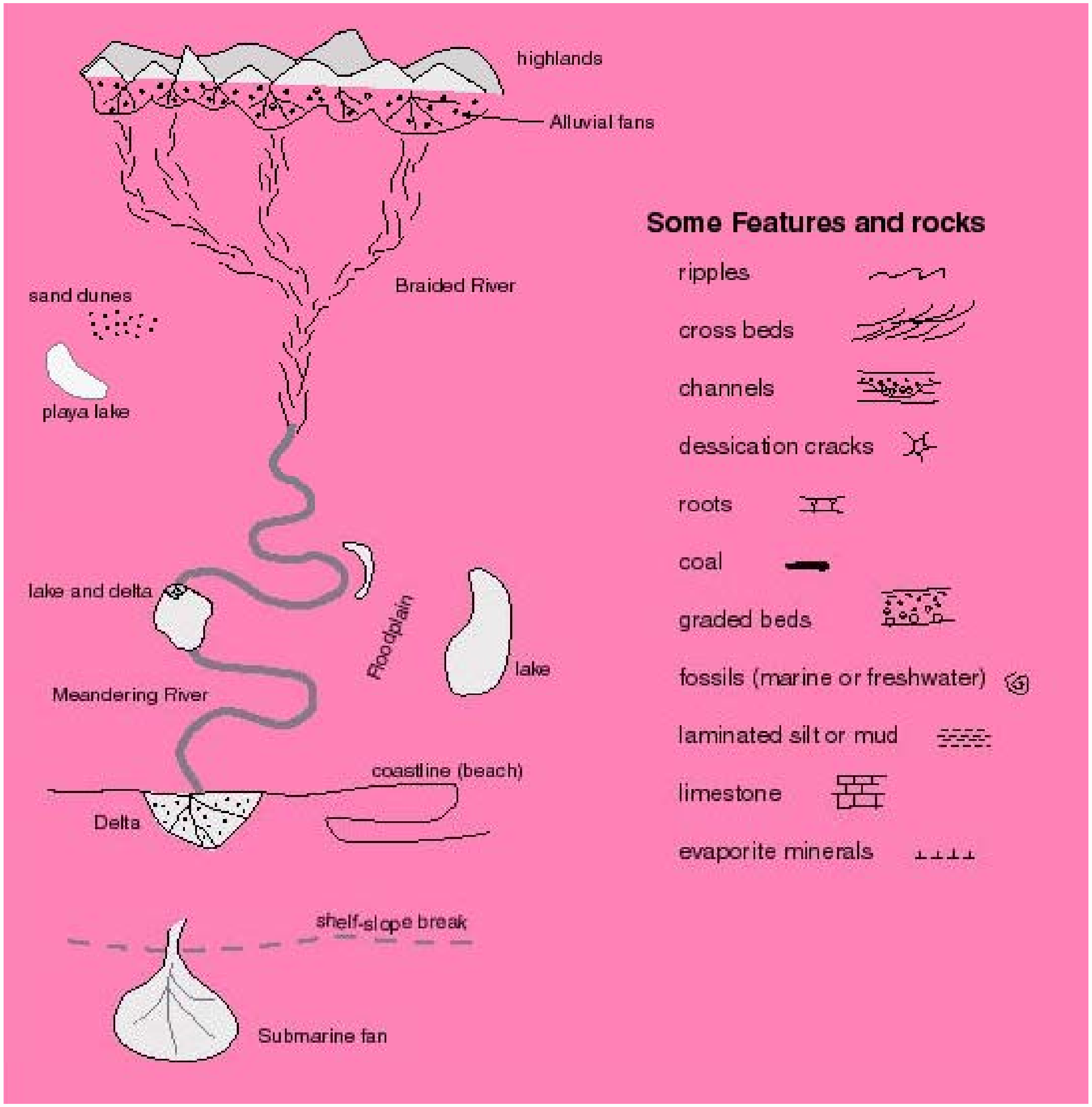
Clastic Depositional Environments

Reconstruction of the Cretaceous Gates Formation
A wave dominated shoreline, northeastern British Columbia



http://www.eos.ubc.ca/resources/slidesets/clastic/clastic.html



http://darkwing.uoregon.edu/~millerm/depenvsmap.html

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Sediment transported by

- **Suspension load** is when sediments are carried in suspension (usually fine-grained sediments that can be carried along easily by the flow)
- **Bed load** is when the forward force of the moving current acts more directly on the larger particles at the bottom as it pushes, rolls, and slides them along
- **Saltation** is more complex and usually affects sand-sized particles. Here, the particles are sucked up by eddies into the flow, travel with the flow for a while, and then fall back to the bottom

Sediment structures

- **Asymmetrical ripples** are ripples that have a gentle slope upstream and a steep slope downstream.
- **Cross-bedding** is inclined bedding and commonly forms in alluvial environments.
- **Potholes** are rounded depressions caused by swirling currents and eddies.
- **Mud cracks** are formed by evaporation on mudflats or in shallow lakes.

Continental Environment

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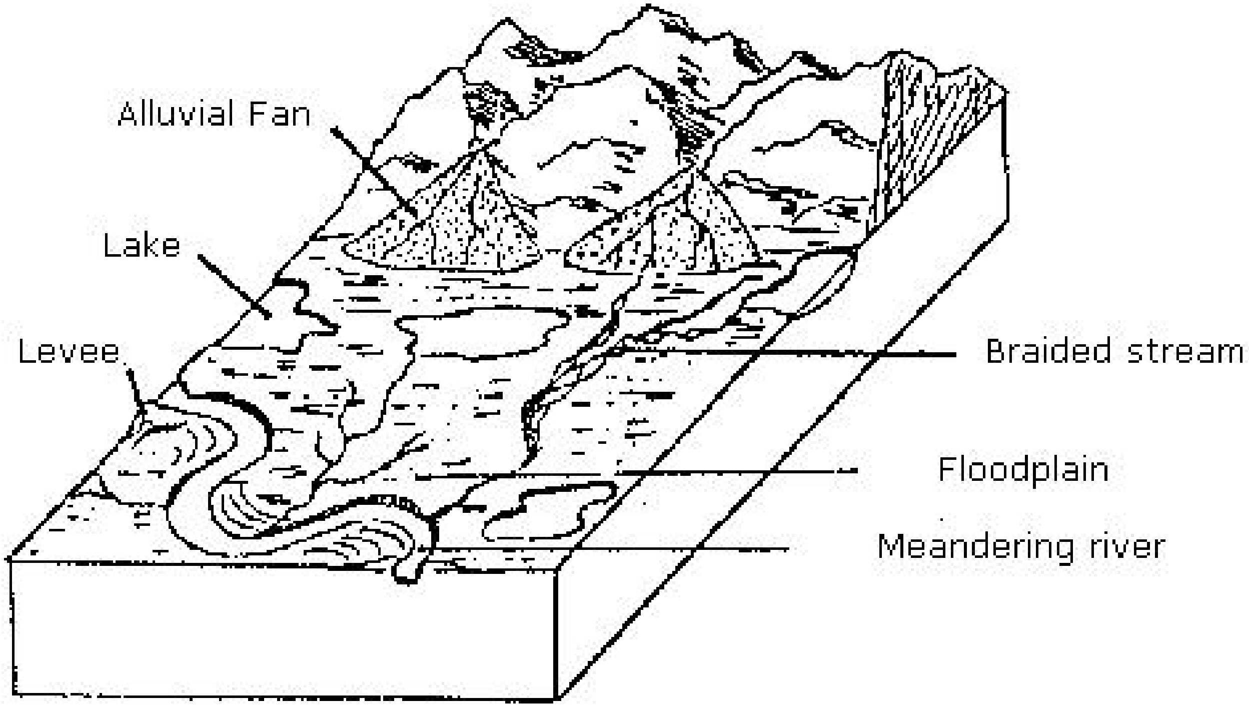
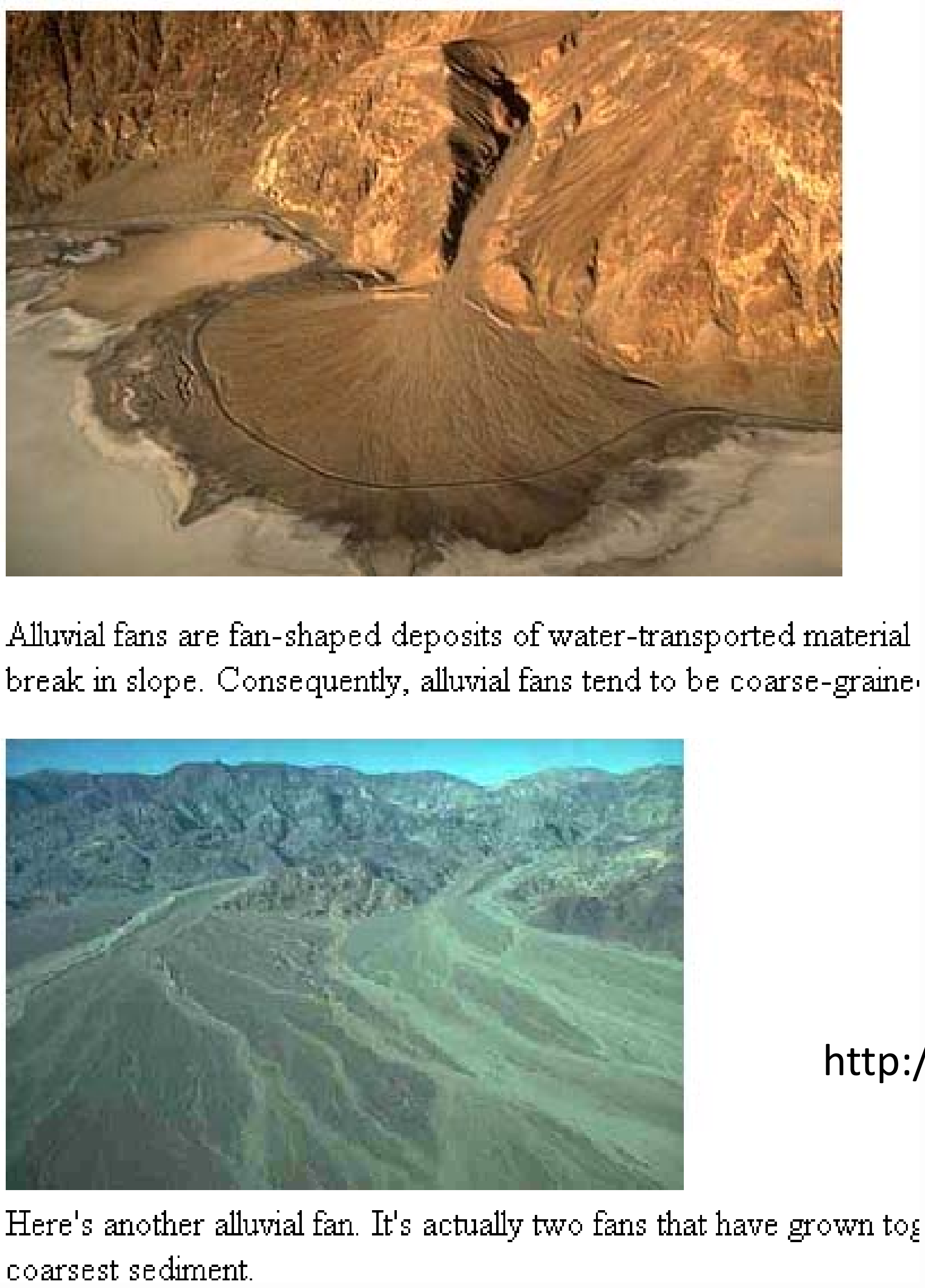
Continental Sedimentary Environments



Alluvial Fans

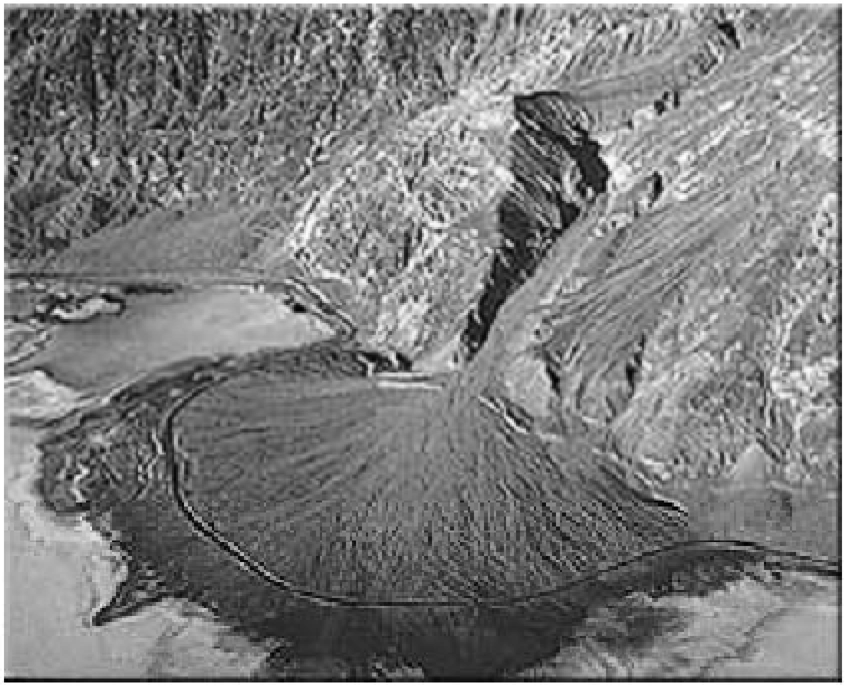
- Alluvial fans are sedimentary deposits that typically form at the margins of a dry basin.
- They typically contain coarse boulders and gravels and are poorly sorted.
- Fine-grained sand and silt may be deposited near the margin of the fan in the valley, commonly in shallow lakes.
- These lakes may periodically dry, and evaporite deposits may result.



Alluvial fans are fan-shaped deposits of water-transported material
break in slope. Consequently, alluvial fans tend to be coarse-graine

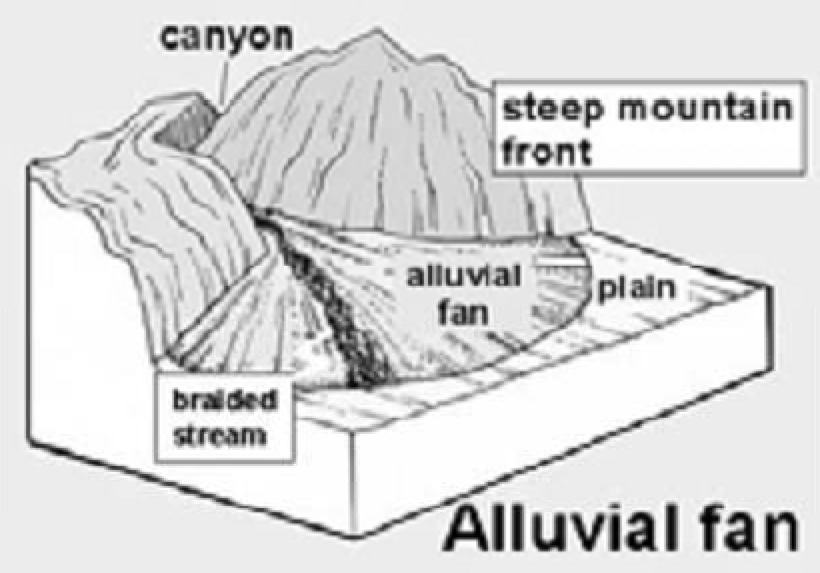
Here's another alluvial fan. It's actually two fans that have grown tog
coarsest sediment.

http://www.uoregon.edu/~millerm/fan.html



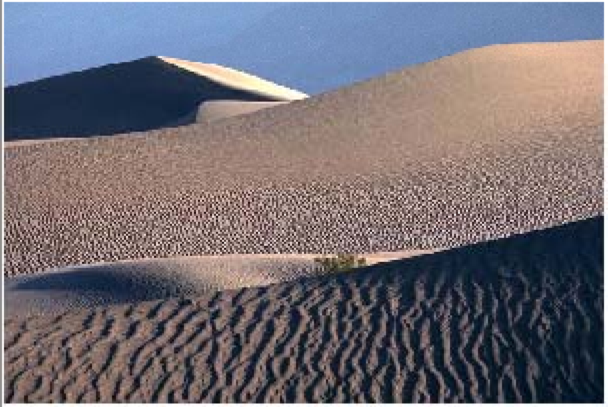
Alluvial Fans form on the fronts of mountain ranges;

fast moving water deposits boulders, gravel, & sand

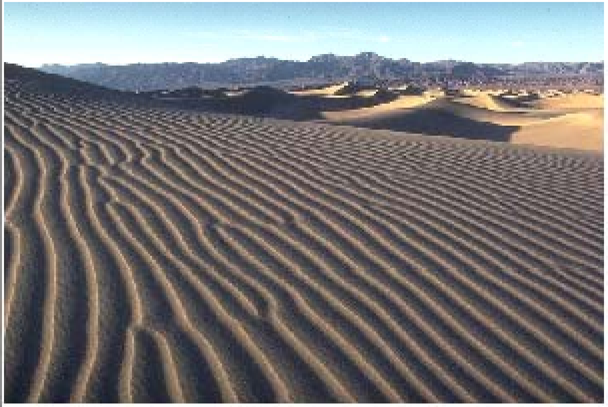


Eolian

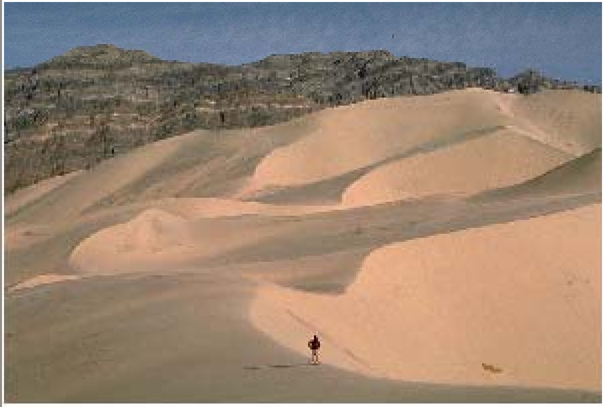
- Wind is an effective sorting agent and will selectively transport sand.
- Gravel is left behind and dust-sized particles are lifted high into the atmosphere and transported great distances.
- Windblown sand forms dunes that are characterized by well-sorted grains showing large-scale crossbedding.



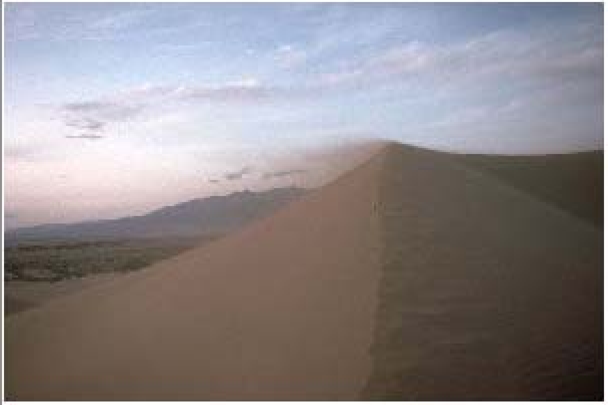
Dunes and Ripples; Mesquite Flat, Death Valley, CA



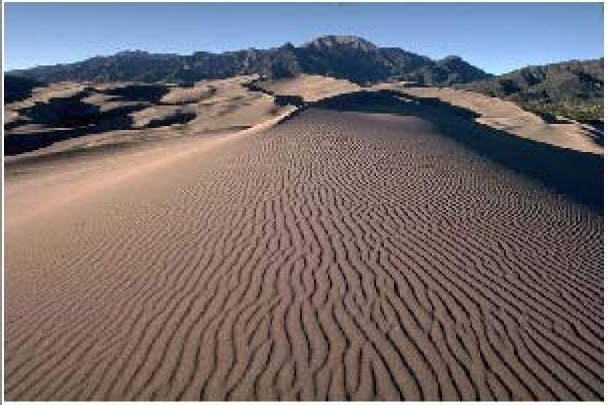
Dunes and Ripples, Mesquite Flat, Death Valley, CA.



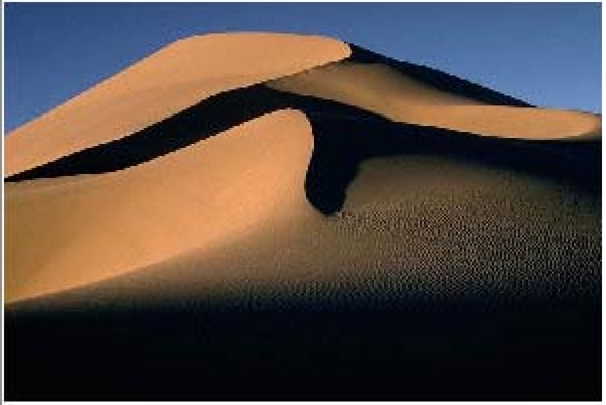
Eureka Sand Dunes, California



Sand blowing off crest of dune.



Great Sand Dunes National Monument, Colorado



Ibex Dunes, California

http://www.uoregon.edu/~millerm/sanddunes.html

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Glacial

- Glaciers do not effectively sort the materials that they transport.
- Common type of resulting deposit is an unstratified accumulation of boulders, gravel, sand, and fine silt for which the term "till" is usually applied.

Rivers

- **Fluvial environments** include **braided** and **meandering** river and stream systems.
- River channels, bars, levees, and floodplains are parts (or subenvironments) of the fluvial environment.
- Channel deposits consist of coarse, rounded gravel, and sand.
- Bars are made of sand or gravel.
- Levees are made of fine sand or silt.
- Floodplains are covered by silt and clay.